

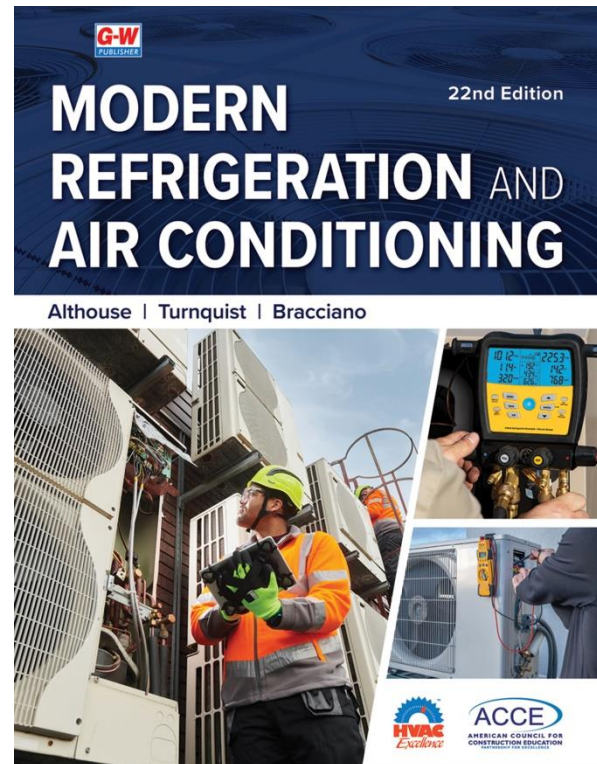


Correlation of
Modern Refrigeration and Air Conditioning, by Althouse, Turnquist, Bracciano
 (Goodheart-Willcox Publisher ©2025)
 to
HVAC Excellence Competencies Task List: Oil Heat

The following chart correlates the *Modern Refrigeration and Air Conditioning* textbook (©2025) to an area of the HVAC Excellence Competencies Task List.

The chart lists individual competency and task standards, and the corresponding chapter numbers from *Modern Refrigeration and Air Conditioning*.

For more information on HVAC Excellence and related certifications, please visit: www.hvacexcellence.org.



Competency / Task	Textbook Chapters
Competencies with an asterisk are recommended by the United States Department of Energy.	
Students must have knowledge of oil heating systems, their components, and be able to demonstrate proficiency in:	
Describing and explaining the function of up flow, downflow, and horizontal furnaces	Chapter 34
Describing combustion theory and heating fuels	Chapter 34
Describing the properties of various heating fuels	Chapter 34
Defining Btu	Chapters 6, 34, Appendices
Defining AFUE	Chapters 34, 40

**Correlation of *Modern Refrigeration and Air Conditioning, 22e* to
HVAC Excellence Competencies Task List: Oil Heat—page 2**

Competency / Task	Textbook Chapters
Describing and using the sensible heat formula	Chapters 6, 30, 51
Describing the principles of humidification	Chapter 24
Describing the principles of dehumidification	Chapter 24
Explaining the Btu content and specific gravities of various fuel oils	Chapter 34
Describing the oil pressures (and vacuum levels) on an operating oil-fired heating system	Chapter 34
Measuring the oil pressures (and vacuum levels) on an operating oil-fired heating system	Chapter 34
Measuring the flue gas temperatures of furnaces	Chapter 34
Determining the amount of combustion air required to safely burn oil in a furnace	Chapter 34
Defining primary and secondary air	Chapters 33, 34
Differentiating between primary air and excess air	Chapters 33, 34
Describing the causes of burner “flashback”	Chapter 33
Describing the causes of a lifting flame	Chapter 33
Stating the reason for appropriate polarity wiring on solid-state circuits	Chapters 14, 15, 17, 19, 34
Stating the generally accepted standard oil pressure for a residential furnace	Chapter 34

**Correlation of *Modern Refrigeration and Air Conditioning, 22e* to
HVAC Excellence Competencies Task List: Oil Heat—page 3**

Competency / Task	Textbook Chapters
Describing, explaining the function of, evaluating, cleaning, and replacing (when feasible) the following components: Oil valves used with residential furnaces Oil pressure regulating valves Orifice Heat exchanger Flue baffles Fuel oil pump Cadmium sulfide cell Burner primary safety control Ignition module Spark igniter High-voltage ignition transformer Flame sensor Combination fan and limit switch Door safety switch Blower motor relay Vent blower motor Vent pressure switch Vent motor relay Single-stage thermostat Dual-stage thermostat Run and start capacitor	Chapters 13, 14, 15, 16, 17, 19, 34
Describing a blower housing cut-off plate	Chapter 23
Identifying the different types of venting systems	Chapters 33, 34
Sizing and installing the venting systems	Chapter 34
Installing fuel lines	Chapter 34
Describing the purpose and operation of delayed action solenoid valve	Chapter 34
Describing the function of a barometric draft control	Chapter 34
Describing the testing and adjustment procedure of a barometric draft control	Chapter 34
Describing the function of and the testing method for a fuel unit cut-off	Chapter 34
Describing the procedure to perform a smoke test on an oil furnace	Chapter 34
Installing a fire-stop support plate	—
Adjusting blower fan speed for proper temperature rise	Chapters 30, 47
Describing the procedure for measuring static pressure	Chapters 28, 30
Sizing wires with regards to voltage drop and length of wiring run	Chapters 13, 14, 16, 19, 21, 26, 34, 35, 48, 49

**Correlation of *Modern Refrigeration and Air Conditioning, 22e* to
HVAC Excellence Competencies Task List: Oil Heat—page 4**

Competency / Task	Textbook Chapters
*Describing dual fuel heat pump systems	Chapters 33, 34
*Installing and servicing a dual fuel thermostat	Chapters 33, 34
*Describing the system balance point in a dual fuel system and how it is derived	Chapters 33, 34
Describing and demonstrating proper soldering procedures for electrical wiring	Chapters 5, 14
Describing and demonstrating proper installation of a single- and two-stage thermostats	Chapters 14, 16, 17, 19, 26, 30, 34
Describing and demonstrating proper installation of a communication-type thermostat	Chapter 36
Describing the procedure for adjusting airflow on a belt-driven blower assembly	Chapters 30, 47
Describing the procedure to de-rate a gas furnace at altitudes of 2,000 feet and above	Chapters 33, 34
Describing and demonstrating proper use of a combustion analyzer	Chapters 33, 34
Identifying the different types of conduits used for power	Chapter 14
Installing duct connectors and hangers	Chapter 30
Describing and demonstrating proper installation of a duct-mounted carbon monoxide detector	Chapter 33
Students should have knowledge of and be able to describe and demonstrate the following safety requirements:	
Ladder safety procedures	Chapter 2
Clearances to combustibles for venting materials	Chapters 34
Flue gas testing procedures for carbon monoxide	Chapters 33, 34
Ambient air testing procedures for carbon monoxide	Chapters 33, 34
Proper safety procedures to follow on discovery of an oil leak	Chapter 34
Describe the safety procedure to be followed upon discovery of a defective heat exchanger	Chapter 34
Oil heat troubleshooting and problem solving:	
Troubleshooting and problem solving involves diagnostic procedures requiring the use of test instruments, data plate information, and wiring diagrams. All of the oil furnace system components, circuits, air distribution system, and/or power supply should be part of troubleshooting and problem solving.	Chapters 4, 5, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 31, 34, 43

**Correlation of *Modern Refrigeration and Air Conditioning, 22e* to
HVAC Excellence Competencies Task List: Oil Heat—page 5**

Competency / Task	Textbook Chapters
Knowledge of the following test instruments and tools is required:	
Combustion analyzer Stack thermometers Carbon monoxide detector Ammeter Manometers Anemometer Ohmmeter Velometer Pressure gauges Voltmeter	Chapters 4, 5, 11, 12, 18, 28, 34